

REMARKS

Claims 1-24 are pending. In the Office Action, the Examiner rejected claim 6 under 35 U.S.C. §112, rejected claims 15, 16, 17, and 20 as being unpatentable under 35 U.S.C. §102(b), and further rejected claims 1-14, 18-19, 21-24 as being unpatentable under 35 U.S.C. §103(a). By this communication, Applicants amend claims 1, 6, 8, 15, 17, 23 and 24, and add claim 25. No new matter is added by way of these amendments or the new claim. The appendix below includes a complete set of claims, and also marks the changes made to the amended claims. Applicants respectfully request reconsideration of the pending claims in view of the amendments and remarks set forth below.

Rejection Under 35 U.S.C. §112

In paragraph 2, the Examiner rejected claim 6 as having insufficient antecedent basis for the limitation "...the dynamic search structure..." Applicants respectfully traverse these rejections as applied to the amended claims. Claim 6 now recites antecedent basis to the "dynamic search structure" of claim number five (5).

Rejection Under 35 U.S.C. §102(b)

In paragraph 4, the Examiner rejected claims 15 and 16 as being anticipated under 35 U.S.C. §102(b) by U.S. Patent No. 5,509,110 to Latham (hereinafter *Latham*). Specifically, the Examiner stated that *Latham* discloses "a span generator" and "a visible surface determination module responsive to the depth data associated with each of the spans, [and] for determining visible segments of each of the spans..." Applicants respectfully traverse with respect to amended claim 15.

Independent claim 15 now recites, inter alia, "a visible surface determination module responsive to the depth data associated with each of the spans, for determining visible segments of each of the spans ***by comparing depth information for each span with depth information defined by an area represented by a piecewise function***, and for generating position data..." (emphasis added). Applicants note that none of the passages in *Latham* cited by the Examiner anticipate, teach, or suggest comparing depth information for each span with depth information defined by an area represented by a

piecewise function. On the contrary, *Latham* discloses comparing “minimum and maximum Z values of a polygon’s contribution to a region” with “previously determined values for a hierarchy of subregions” (col. 2, lines 55-58). *Latham* does not disclose comparing depth information for each span with depth information defined by an area represented by a piecewise function. Because claim 15 includes limitations not disclosed by *Latham*, the invention of claim 15 is not anticipated thereby.

Claim 16 directly depends and further limits independent claim 15, and is allowable for at least the same reasons advanced with respect to claim 15.

In paragraph 5, the Examiner rejected claims 17 and 20 as being anticipated under 35 U.S.C. §102(b) by U.S. Patent No. 5,303,386 to Fiasconaro (hereinafter *Fiasconaro*). Applicants note that independent claim 17 now recites, inter alia, “a graphics engine coupled to the processing device for performing visible surface determination *by comparing depth information for a span with depth information defined by an area represented by a piecewise function*” (emphasis added).

Applicants note that none of the passages in *Fiasconaro* cited by the Examiner anticipate, teach, or suggest comparing depth information for each span with depth information defined by an area represented by a piecewise function. On the contrary, *Fiasconaro* is directed to a “graphics accelerator [that] produces device coordinates for trimmed polygons” computed as patches of a display area (*Fiasconaro* Abstract). *Fiasconaro* does not address comparing depth information at all, but rather speaks to truncating surfaces to be rendered by the graphics accelerator (*Fiasconaro* Abstract, figures 1-8). Because claim 17 includes limitations not disclosed by *Fiasconaro*, the invention of claim 17 is not anticipated thereby.

Claim 20 directly depends and further limits independent claim 17, and is allowable for at least the same reasons advanced with respect to claim 17.

Rejection under 35 U.S.C. §103(a)

In paragraph 2 under the heading “Claim Rejections - 35 U.S.C. §103,” the Examiner rejected claims 1-4, 8-12, and 23-24 under 35 U.S.C. §103(a) as being unpatentable over *Fiasconaro*, in view of Cheng et al. (hereinafter *Cheng*), “Clipping of Bezier Curves”.

With respect to independent claim 1, the Examiner stated that *Fiasconaro* discloses representing depth information by a piecewise function, and dividing the primitive object according to areas defined by the piecewise function. The Examiner declared, however, that while *Fiasconaro* does not explicitly disclose the elements of performing a visibility test and updating the piecewise function based on the results of the visibility test, Cheng discloses these elements. The Examiner further maintained that it would have been obvious to modify *Fiasconaro* with the teachings of *Cheng*, with a motivation to avoid outputting all the edges of the approximating polygon to the graphics system for clipping.

Applicants note that independent claim 1 now recites, inter alia, “performing a visibility test ***based on depth information for the areas***” (emphasis added), which is not disclosed or suggested by *Fiasconaro* or *Cheng* or the combination of the two. Neither *Fiasconaro* nor *Cheng* disclose a visibility test based on depth information for areas of polygons being processed for display. Further, Applicant amended claim 1 to distinguish the function representing the depth information from the function defining the areas.

Fiasconaro and *Cheng* discuss clipping of, respectively, surface patches and Bezier curves. *Fiasconaro* states, “trimming is performed on B-spline surface patch descriptions in a hardware graphics accelerator... [which receives] descriptions of trimming curves in the uv parameter space of the patch generation functions” (col. 1, lines 57-62). *Fiasconaro* discloses only trimming a surface patch with another function. As noted by the Examiner, *Fiasconaro* does not disclose performing a visibility test based on depth information for areas of polygons.

A prima facie case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention, *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). *Fiasconaro* teaches away from the invention of claim 1. One outcome of the invention of claim 1 is a significant reduction

in graphics processing resources and memory requirements, since only a few parameters are needed to encode depth information which is represented by a piecewise analytical function. On the contrary, *Fiasconaro* teaches away from such resource reduction by “comput[ing] a sufficiently dense point by point representation of each trimming curve in uv space, in addition to point by point representations of the individual subspans in uv space whose associated polygons in XYZ space approximate the patch” (col. 1 line 64 to col. 2 line 1). Therefore, the method described in *Fiasconaro* dramatically increases graphics processing resources and memory requirements by creating many additional polygon vertices, which is counter to the teachings of the invention of claim 1.

Similarly, *Cheng* does not disclose or suggest a visibility test based on depth information for areas of polygons to be displayed. *Cheng* discloses only clipping a curve in order to prevent display overflow, to “find out which portions of the [Bezier] curve are inside and which are outside the window” (*Cheng*, page 74, paragraph 1). *Cheng* states, “when a parametrically defined curve or surface is to be displayed, clipping must always be done prior to being output to the display device to avoid overflow” (*Cheng*, page 74, paragraph 1). *Cheng* does not disclose performing a visibility test based on depth information for areas of polygons, as required by claim 1. Applicants submit that both *Fiasconaro* and *Cheng* fail to teach, motivate, or suggest the claimed invention. Applicants submit that claim 1 is nonobvious in light of the cited references and is in condition for allowance.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, claims 2-7, dependent upon claim 1, are nonobvious.

With respect to independent claim 8, the Examiner rejected with the rationale of the rejection of claim 1. The Examiner stated that claim 8 is merely claim 1 recited as an apparatus. Applicants note that claim 8 now recites, inter alia, “a third module for performing a visibility test ***based on depth information for the areas***” (emphasis added). As noted above with respect to claim 1, *Fiasconaro* or *Cheng* or the combination of the two references does not disclose or suggest performing a visibility test based on depth information for areas of polygons. Applicants submit that claim 8 is nonobvious in light of the cited references and is in condition for allowance.

Claims 9-14, which depend from independent claim 8, are nonobvious under *In Re Fine* and are in condition for allowance.

With respect to independent claim 23, the Examiner rejected with the rationale of the rejection of claim 1. The Examiner stated that claim 23 is merely claim 1 recited as a program. Applicants note that claim 23 now recites, inter alia, “performing a visibility test ***based on depth information for the areas***” (emphasis added). As noted above with respect to claim 1, *Fiasconaro* or *Cheng* or the combination of the two references does not disclose or suggest performing a visibility test based on depth information for areas of polygons. Applicants submit that claim 23 is nonobvious in light of the cited references and is in condition for allowance.

With respect to independent claim 24, the Examiner rejected with the rationale of the rejection of claim 1. The Examiner stated that claim 24 is merely claim 1 recited as a system. Applicants note that claim 24 now recites, inter alia, “means for performing a visibility test ***based on depth information for the areas***” (emphasis added). As noted above with respect to claim 1, *Fiasconaro* or *Cheng* or the combination of the two references does not disclose or suggest means for performing a visibility test based on depth information for areas of polygons. Applicants submit that claim 24 is nonobvious in light of the cited references and is in condition for allowance.

With respect to claims 18, 19, and 22, which depend directly or indirectly from independent claim 17, the Examiner rejected these claims as being unpatentable over *Fiasconaro* as applied to independent claim 17 in view of U.S. Patent No. 6,285,378 to Duluk, Jr. (hereinafter *Duluk*). The Examiner stated that, “the system of *Fiasconaro* as applied to claim 17 above meets the limitations recited in claim 17” except wherein dependent claims 18, 19, and 22 respectively add further limitations. The Examiner asserted that *Duluk* discloses the respective limitations of these dependent claims, and further maintained that it would have been obvious to modify *Fiasconaro* with *Duluk*.

As noted above with respect to claim 17, independent claim 17 now recites, inter alia, “a graphics engine coupled to the processing device for performing visible surface determination ***by comparing depth information for a span with depth information defined by an area represented by a piecewise function***”. Applicants note that *Fiasconaro* does not teach or suggest comparing depth information for a span with depth

information defined by an area represented by a piecewise function. Furthermore, as noted above with respect to claim 17, *Fiasconaro* does not address comparing depth information at all, but rather speaks to truncating surfaces to be rendered by the graphics accelerator (*Fiasconaro* Abstract, figures 1-8).

A prima facie case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention, *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). As noted above with respect to claim 1, *Fiasconaro* teaches away from the instant invention. The invention of claim 17 provides a significant reduction in storage and bandwidth requirements for implementing HSR/VSD in 3D graphic processing, since only a few parameters are needed to compare depth information which is represented by a piecewise analytical function. On the contrary, *Fiasconaro* teaches away from such reductions by “comput[ing] a sufficiently dense point by point representation of each trimming curve in uv space, in addition to point by point representations of the individual subspans in uv space whose associated polygons in XYZ space approximate the patch” (col. 1 line 64 to col. 2 line 1). Therefore, the method described in *Fiasconaro* dramatically increases memory requirements by creating new polygon vertices, which is counter to the teachings of the instant invention.

Applicants submit that the combination of *Fiasconaro* and *Duluk* does not equal the instant invention of claim 17 or its dependent claims, and that claims 18, 19, and 22 are nonobvious in light of the cited references and are in condition for allowance.

With respect to claim 21, the Examiner rejected this claim under 35 U.S.C. §103(a) as unpatentable over *Fiasconaro* as applied to claim 17 in view of *Latham* further in view of U.S. Patent No. 6,512,516 to Schill et al. (hereinafter *Schill*). The Examiner stated that the method of *Fiasconaro* would have been obvious to combine with the teachings of *Latham* for the motivation to “make it relatively fast and easy to insert and find elements” (*Schill*, column 5, line 22-26).

Applicants submit that reliance on *Schill* is misplaced as outside the field of the instant invention, and therefore not valid art upon which to base an obviousness rejection. “In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably

pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992).

The present invention of claim 21 pertains particularly to Visible Surface Determination in computerized three-dimensional (3D) graphics image processing (specification, page 1). On the contrary, *Schill* pertains "to a system for rapidly deforming volumetric inhomogeneous objects" (*Schill* col. 1, lines 9-10) in which "the 3D ChainMail algorithm is enhanced based on a physical model of how information is propagated through a body by passing it from one element to another" (col. 1, lines 56-59). *Schill* relates to physical modeling of biomechanical structures, and is not "in the field" or "reasonably pertinent to the particular problem" of Visible Surface Determination in computerized three-dimensional (3D) graphics image processing. Applicants therefore submit that a prima facie case for obviousness is not made with respect to claim 21, and claim 21 is in condition for allowance.

CONCLUSION

Applicants respectfully submit that the rejections of all claims by the Examiner in the Office Action of April 9, 2003 have been traversed. In particular, the above remarks demonstrate that *Latham* or *Fiasconaro* do not anticipate all elements of the claimed invention. *Fiasconaro*, *Cheng*, *Duluk*, or *Schill*, either individually or in combination, do not teach all of the claim limitations in the claimed invention. Thus, upon consideration of the above remarks, Applicants submit that the application is in condition for allowance, and respectfully request the issuance of a Notice of Allowability.

Respectfully submitted,
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